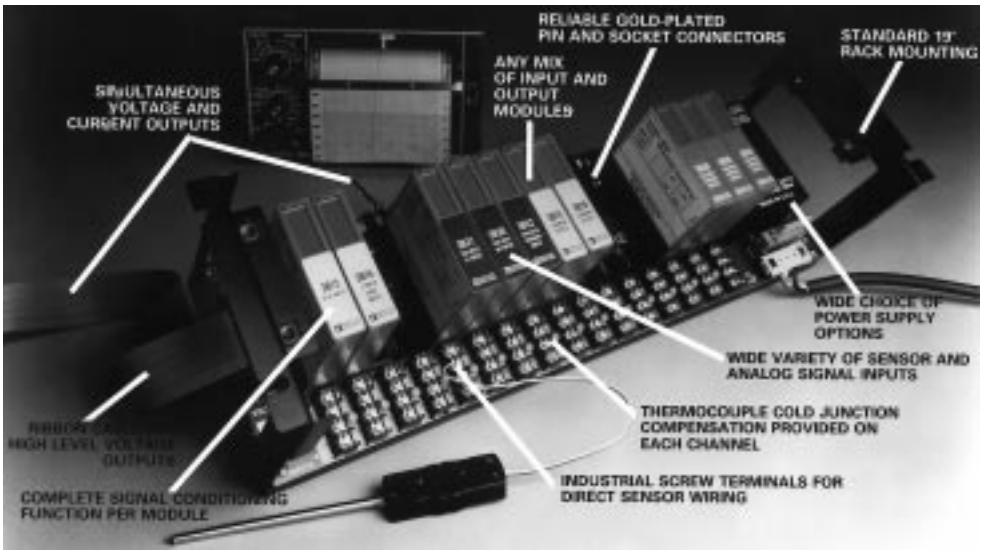
The Complete Signal Conditioning I/O Subsystem

3B Series



FEATURES/BENEFITS

Low Cost, Completely Integrated 16-Channel Modular Signal Conditioning Subsystem
- Wide Selection of Functionally Complete Input and Output Plug-In Modules
- Rugged Industrial Chassis, Rack or Surface Mounted
- Onboard Power Supplies Available

Analog Input Modules Available for Direct Interface to a Wide Variety of Signal Sources
- Sensors: Thermocouples, RTDs, AC and DC Strain Gages, Torque Transducers, Load Cells, Frequency, LVDT, AD590/AC2626 Millivolt and Voltage Sources
- 4–20 mA/0–20 mA Process Current Inputs

Current Output Modules
- 4–20 mA/0–20 mA Outputs

Complete Signal Conditioning Function
- Input Protection
- Low-Pass Filtering
- Amplification
- Galvanic Isolation to ±1500 V
- Wide-Range Zero Suppression
- High Noise Rejection and RFI/EMI Immunity
- Sensor Excitation When Required
- Simultaneous Voltage and Current Outputs

Mix and Match Input Capability and Dual High Level Outputs Provide Excellent System Flexibility

Interfaces Directly to Types J, K, T, E, R, S and B Thermocouples
- Cold Junction Compensation on Each Channel
- Open Input Detection

Specifications Valid Over the –25°C to +85°C Temperature Range

High CMV Isolation, High Accuracy and Low Drift Provide a High Performance Data Acquisition Solution
- Channel-to-Channel and Input-to-Output Isolation of ±1500 V is Provided by the Isolated Modules
- Accuracy for All Module Types is ±0.1%
- Chopper-Stabilized Amplification Assures Low Drift (±1 μV/°C) and Excellent Long Term Stability

Isolated Modules Designed to Meet IEEE Standard for Transient Voltage Protection (ANSI/IEEE-C37.90.1-1989)

Wide Range Zero Suppression
- Any Portion of the Input Span Can be Mapped Into the Full Output Span

User Configurability
- Unique Plug-On Component Carrier Allows Users to Easily Create Customized Ranges With Complete Control Over Zero Suppression and Span Without Opening the Module

Easy to Install, Calibrate and Service
- Direct Connections to Industrial Screw Terminals
- Modules Removable Without Disturbing Field Wiring or Power
- Front Panel Zero and Span Adjustments for Both Voltage and Current Outputs

Convenient Connection to User's Equipment
- Interfaces Directly to Analog I/O Subsystems Used for for Single Board Computer Interfaces
- Universal Adapter Board Allows Easy Interface to Any Equipment

FM Approved
- Approved for Use in Class I, Division 2, Groups A, B, C and D Locations

CE Approval: All 3B Modules and Backplanes Meet the European EMC Directive

REV. A

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3B Series

GENERAL DESCRIPTION

The 3B Series Signal Conditioning I/O Subsystem provides a low cost, versatile method of interconnecting real world analog signals to a data acquisition, monitoring or control system. It is designed to interface directly to analog signals such as thermocouple, RTD, ac and dc Strain Gage, Torque Transducer, Frequency, LVDT, AD590/AC2626 solid state temperature sensor outputs, and millivolt or process current signals, and convert the inputs to standardized analog outputs compatible with high level analog I/O subsystems.

The 3B Series Subsystem consists of a 19″ relay rack, compatible universal mounting backplane and a family of plug-in input and output signal conditioning modules (up to 16 per rack). 8- and 4-channel backplanes are also available. Each backplane incorporates screw terminals for sensor inputs and current outputs and a connector for high level, single-ended outputs to the user's equipment.

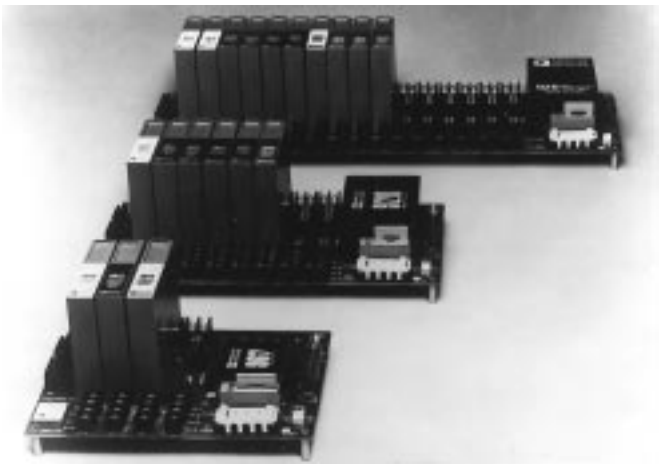
Input and output modules are offered in both isolated (±1500 V peak) and nonisolated versions. The input modules feature complete signal conditioning circuitry optimized for specific sensors or analog signals, and provide high level analog outputs. Each input module provides two simultaneous outputs: 0 V to +10 V (or ±10 V) and 4–20 mA (or 0–20 mA). Output modules accept 0 V to +10 V (or ±10 V) single ended signals and provide an isolated or nonisolated 4–20 mA (or 0–20 mA) process signal. All modules feature a universal pinout and may be readily "mixed and matched" and interchanged without disrupting field wiring.

Each backplane contains the provision for a subsystem power supply. The 3B Series Subsystem can operate either from a common dc/dc or ac power supply mounted on each backplane, or from externally provided dc power. Two LEDs are used to indicate that power is being applied.

APPLICATIONS

The Analog Devices 3B Series Signal Conditioning Subsystem is designed to provide an easy and convenient solution to signal conditioning problems in measurement and control applications. Some typical uses are in mini- and microcomputer-based systems, standard data acquisition systems, programmable controllers, analog recorders, dedicated control systems and any other applications where monitoring and control of temperature, pressure, flow, and analog signals are required. Since each input module features two simultaneous outputs, the voltage output can be used to provide an input to a microprocessor-based data acquisition or control system, while the current output can be used for analog transmission, operator interface or an analog backup system.

The 4B Series Alarm Trip Subsystem is available as a companion product to address alarm or ON/OFF control needs. It can also be used to provide alarm indication for transmitters or other high level inputs. It is particularly useful in computer-based applications where redundant alarming is required.



DESIGN FEATURES AND USER BENEFITS

Ease of Use: Direct sensor interface via screw terminals, standardized high level outputs, factory precalibration of each unit and the modular design make the 3B Series Subsystem extremely easy to use. The subsystem features rugged packaging for the industrial environment and can be easily installed and maintained.

High Reliability: To assure high reliability, all field wired terminations offer 130 V or 220 V rms normal-mode protection. Gold plated pin and socket connectors are used throughout the system to assure connection reliability. The isolated modules offer protection against high common-mode voltages and are designed to meet the ANSI/IEEE Standard for Transient Voltage Protection (C37.90.1-1989).

High Performance: The high quality signal conditioning features ±0.1% calibration accuracy and chopper-based amplification, which assures low drift (±1 μV/°C) and excellent long term stability. For thermocouple applications, high accuracy cold junction sensing is provided in the backplane on each channel. Low drift sensor excitation is provided for RTD, strain gage, LVDT and AD590 models. RTD models and the 3B47 thermocouple model linearize the input signal to provide an output that is linear with temperature.

High Noise Rejection: The 3B Series Subsystem was designed to accurately process low level signals in electrically noisy environments by providing excellent common-mode and normal-mode noise rejection and RFI/EMI immunity.

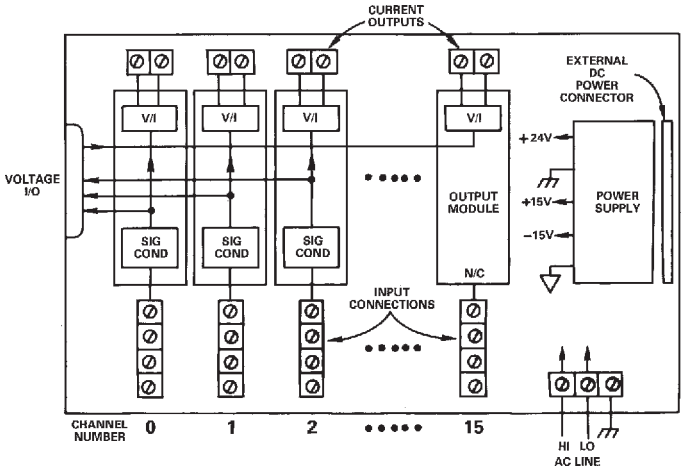


Figure 1. 3B Series System Functional Block Diagram

FEATURES

Wide Variety of Sensor Inputs
Thermocouples, RTDs, AC and DC Strain Gages, Torque Transducers, Frequency, LVDT, AD590/AC2626
Dual High Level Outputs
Voltage: 0 V to +10 V or ±10 V
Current: 4–20 mA/0–20 mA
Mix and Match Input Capability Sensor Signals, mV, V, 4–20 mA, 0–20 mA
High Accuracy: ±0.1%
Low Drift: ±1 μV/°C
Reliable Transformer Isolation:
±1500 V CMV, CMR = 160 dB
Meets ANSI/IEEE-C37.90.1-1989: Transient Protection
Input Protection: 130 V or 220 V rms Continuous
Low Cost Per Channel

GENERAL DESCRIPTION

Each input module is a single-channel signal conditioner that plugs into sockets on the backplane and accepts its signal from the input screw terminals. All input modules provide input protection, amplification and filtering of the input signal, accuracy of ±0.1%, low drift of 1 μV/°C (low level input modules), and feature two high level analog outputs that are compatible with most process instrumentation. The isolated input modules also provide ±1500 V isolation.

The choice of a specific 3B module depends on the type of input signal and also whether an isolated or nonisolated interface is required. Input modules are available to accept millivolt, volt, process current, thermocouple, RTD, ac and dc strain gage, torque transducer, frequency, LVDT and AD590 inputs. The voltage output of each module is available from the voltage I/O connector, while the current output is available on the output screw terminals. Figure 3 defines all analog input connections.

The transfer function provided by each input module is:
Input – specified sensor measurement range
Outputs – 0 V to +10 V dc or ±10 V
4–20 mA, nonisolated
(0–20 mA output programmed by a jumper option on the module)

Note: The 3B47 linearized thermocouple input module has only a 0 V to +10 V output; it does not have a 4–20 mA output.

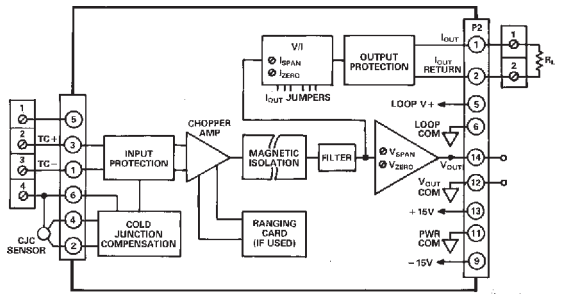


Figure 2. Model 3B37 Functional Block Diagram

For example, Figure 2 shows a functional diagram for the model 3B37 isolated thermocouple signal conditioner. The input signal is filtered, amplified and has cold junction compensation applied before the isolation barrier. Reliable magnetic isolation is used to provide isolation protection. The outputs of the module are isolated from the input (up to ±1500 V peak) and calibrated for 0 V to +10 V (voltage output) and 4–20 mA (current output), which correspond to the specified input span.

The input modules are available in several factory-calibrated input ranges. Each input module includes separate screwdriver adjustable zero and span potentiometers for both the voltage output and the current output, which can be used for fine calibration within the chosen range. The voltage and current adjustments are independent and noninteractive, allowing for precise calibration of both outputs.

The current output of each input module has two user programmable jumper options. One option allows the user to program the current output to be proportional to either a 0 V to +10 V output or a –10 V to +10 V output. The second option allows the user to set the current output span to 4–20 mA or 0–20 mA. All modules are shipped from the factory configured so that the current output is proportional to the 0 V to 10 V output, and all current outputs are 4–20 mA.

WIDE ZERO SUPPRESSION CAPABILITY

A wide zero suppression capability and easy custom ranging are available with a unique plug-on ranging card (AC1310). If a special input range is desired, it can be provided by ordering the externally programmable version of the desired module (i.e., 3B32-00) and the plug-on ranging card, AC1310. This card houses user supplied resistors that determine the zero and span of the desired range. RTD modules accept an additional resistor to establish linearization of the input signal, while the 3B37 thermocouple module uses an additional resistor to set the cold junction compensation level.

This ranging capability allows the user to provide zero suppression of up to and beyond 100% of the input range and provide a very wide range of span modification. It also allows the user to map any portion of the input signal to the full output span. For example, a user who wants to measure temperature with a thermocouple in the range of +800°C to +900°C can use this ranging card for greater system resolution within that 100°C temperature span. This tremendous flexibility should satisfy virtually any requirement. The resistor values are determined by equations defined for each module. See the appropriate data sheet within the User's Manual for further details.

Special ranges can also be factory configured. Analog Devices will provide the function when a model 3B _ _-CUSTOM is ordered with the desired range. (The 3B47 linearized thermocouple input module cannot be ranged with an AC1310 since approximately 15 components are required for linearization. A factory-configured 3B47-CUSTOM can provide the desired input range.)

GENERAL INPUT MODULE SPECIFICATIONS

(typical @ +25°C and ±15 V, +24 dc power)

	Isolated Modules	Nonisolated Modules
Inputs	Per Selection Table	*
Outputs[1]	0 V to +10 V @ 5 mA or ±10 V @ ±5 mA 4–20 mA or 0–20 mA @ R_L = 0 Ω to 850 Ω[2]	*
Accuracy[3]	±0.1% Span	*
Nonlinearity[4]	±0.01% Span	*
Stability vs. Ambient Temperature		
Voltage Output		
Zero	±1 µV/°C for G > 100 (RTI)	*
Span	±0.0025% Reading/°C	*
Current Output (w. r. t. Voltage Output)		
Zero	±0.0025% Span/°C	*
Span	±0.0025% Reading/°C	*
Common-Mode Voltage, Input to Output	±1500 V pk max	±6.5 V[5]
Common-Mode Rejection @ 50 Hz or 60 Hz		
1 kΩ Source Unbalance[6]	160 dB	90 dB[5]
Normal-Mode Rejection @ 50 Hz or 60 Hz[7]	60 dB	60 dB
Differential Input Protection[8]	220 V rms, Cont.	130 V rms, Cont.
Voltage Output Protection	Continuous Short to Ground	*
Current Output Protection	130 V rms, Cont.	*
Zero and Span Adjustment Range[9]	±5% of Span	*
Input Transient Protection	Meets ANSI/IEEE-C37.90.1-1989	N/A
Input Resistance	15 MΩ	100 MΩ
Bandwidth[10]	3 Hz (–3 dB) or 10 kHz (–3 dB)	3 Hz (–3 dB) or 20 kHz (–3 dB)
Power Supply[11]	±15 V dc, +24 V dc	*
Size	3.150″ × 0.775″ × 3.395″	*
Environmental		
Temperature Range, Rated Performance	–25°C to +85°C	*
Storage Temperature Range	–55°C to +85°C	*
Relative Humidity Conforms to MIL Spec 202	0 to 95% @ 60°C Noncondensing	*
RFI Susceptibility	±0.5% Span Error, 5W @ 400 MHz @ 3 ft.	*

NOTES
[1]Voltage output range is determined by the module input range while the current output range is user selectable. Model 3B47 does not have a current output.
[2]For a 0-20 mA range, a typical minimum output current is 10 µA.
[3]Accuracy spec includes the combined effects of repeatability, hysteresis and linearity. Does not include sensor or single source error. 3B42, 3B43 and 3B44 have a ±5% accuracy. 3B17 has ±0.1% accuracy when calibrated.
[4]RTD Models 3B14, 3B15, 3B34, LVDT Model 3B17 have a linearization conformity error of ±0.05%.
[5]Models 3B13, 3B14, 3B15, 3B16 and 3B17 each have common-mode voltage determined by the internal excitation circuitry.
[6]Applies only to units with 3 Hz bandwidth. Models 3B18, 3B40, 3B41 have a CMR 100 dB.
[7]Applies only to units with 3 Hz bandwidth.
[8]Includes excitation circuitry for models 3B13, 3B14, 3B15, 3B16, 3B17, 3B18 and 3B34.
[9]A wide range of zero suppression and custom calibration may be accomplished with a custom ranging card, AC1310. Model 3B17 has a gain adjustment range of 256:1 and an output referred zero suppression range of ±5 V.
[10]Model 3B18 has a 20 kHz bandwidth; Models 3B40 and 3B41 have a 10 kHz bandwidth; Model 3B17 has a 100 Hz bandwidth.
[11]+24 V dc power is only needed for driving the current output at up to 850 Ω. If only voltage output is used, or a current output load of 400 Ω or less is desired, ±15 V is all that is required.
*Specifications same as isolated modules.
Specifications subject to change without notice.

Table I. Input Modules Selection

Input Type/Span	Voltage Output	Current Output	Nonisolated Modules	Isolated Modules
DC, ±10 mV, ±50 mV, ±100 mV	±10 V	4–20 mA/0–20 mA	3B10	3B30, 3B40
DC, ±1 V, ±5 V	±10 V	4–20 mA/0–20 mA	3B10	3B31, 3B41
DC, ±10 V	±10 V	4–20 mA/0–20 mA	3B11	3B31, 3B41
DC, 4–20 mA, 0–20 mA	0 V–10 V	4–20 mA/0–20 mA	3B12	3B32
Thermocouple Types J, K, T, E, R, S, B	0 V–10 V	4–20 mA/0–20 mA		3B37
Thermocouple Types J, K, T, E, R, S, B (Linearized)	0 V–10 V			3B47
100 Ω Platinum RTD, 2-, 3-, 4-Wire α = 0.00385 (Linearized)	0 V–10 V	4–20 mA/0–20 mA	3B14	3B34
100 Ω Platinum RTD, Kelvin 4-Wire α = 0.00385 (Linearized)	0 V–10 V	4–20 mA/0–20 mA	3B15	
10 Ω Copper RTD, 2-, 3-Wire	0 V–10 V	4–20 mA/0–20 mA		3B34
120 Ω Nickel RTD, 2-, 3-Wire	0 V–10 V	4–20 mA/0–20 mA		3B34
Strain Gage ±30 mV, ±100 mV	±10 V	4–20 mA/0–20 mA	3B16, 3B18	
LVDT, 4-, 5-, 6-Wire	±10 V	4–20 mA/0–20 mA	3B17	
AD590/AC2626 Solid State Temperature Transducer	0 V–10 V	4–20 mA/0–20 mA	3B13	
AC, 0 mV–50 mV rms, 0 mV–100 mV rms	0 V–10 V	4–20 mA/0–20 mA		3B42
AC, 0 V–10 V rms	0 V–10 V	4–20 mA/0–20 mA		3B43
AC, 0 V–50 V rms, 0 V–250 V rms	0 V–10 V	4–20 mA/0–20 mA		3B44
Frequency 0 Hz–25 Hz, 0 Hz–300 Hz	0 V–10 V	4–20 mA/0–20 mA		3B45
Frequency 0 Hz–1500 Hz, 0 Hz–3000 Hz 0 kHz–25 kHz	0 V–10 V	4–20 mA/0–20 mA		3B46

THERMOCOUPLE INPUT MODELS 3B37, 3B47
The isolated thermocouple models incorporate cold junction compensation circuitry, which provides an accuracy of ±0.5°C over the +5°C to +45°C ambient temperature range. Open thermocouple detection (upscale) is also provided. Standard models are available with factory calibration for thermocouple types J, K, T, E, R, S and B. Model 3B47 provides a linearized 0 V to 10 V output, but has no current output.

RTD INPUT MODELS 3B14, 3B15, 3B34
Each RTD model provides a sensor excitation current of 0.25 mA (1.0 mA for Cu RTDs) and produces an output signal that is linear with temperature with a conformity error of ±0.05% of span and accuracy of ±0.1% span. The lead resistance effect for the three models is ±0.02°C/Ω for the 3B14 and the 3B34, and ±.00001°C/Ω for the 3B15. Model 3B34 is available for 100 Ω Pt, 10 Ω Cu and 120 Ω Ni RTD inputs.

STRAIN GAGE INPUT MODELS 3B16, 3B18
Models 3B16 and 3B18 are designed to accept inputs from full four arm bridge strain gage-type transducers. The 3B16 has a 3 Hz bandwidth, provides a constant +10 V bridge excitation and can be used with a bridge resistance of 300 Ω or greater. Model 3B18 has a 20 kHz bandwidth to interface to dynamic signals, provides a switch selectable excitation of +10 V or +3.3 V, and can be used with a bridge resistance of 100 Ω or greater.

LVDT INPUT MODEL 3B17
Model 3B17 is a nonisolated wideband input module that accepts signals from 4-, 5- or 6-wire LVDT or RVDT transducers. Unlike other 3B modules, all zero and span calibration is accomplished by screwdriver adjustments. Gain can be adjusted on a 256:1 range with a combination of a rotary switch and potentiometer. Zero suppression is output referred and can provide a ±5 V adjustment. The 3B17 provides an ac excitation of 1 V to 5 V rms at frequencies ranging from 1 kHz to 10 kHz.

MILLIVOLT AND VOLTAGE INPUT MODELS 3B10, 3B11, 3B30, 3B31, 3B40, 3B41
Models 3B10 and 3B11 are nonisolated modules that accept millivolt and voltage signals respectively. Models 3B30 and 3B31 are isolated modules that accept millivolt and voltage signals respectively. Models 3B40 and 3B41 each have a 10 kHz bandwidth to interface to dynamic signals and are isolated modules that accept millivolt and voltage signals respectively.

CURRENT INPUT MODELS 3B12, 3B32
Models 3B12 and 3B32 are, respectively, nonisolated and isolated modules that accept process current signals.

AD590/AC2626 INPUT MODEL 3B13
Model 3B13 accepts an AD590 as its input signal.

AC INPUT MODELS 3B42, 3B43 AND 3B44
Models 3B42, 3B43 and 3B44 are isolated modules that accept ac sine wave input signals. Model 3B42 accepts signals ranging from 20 mV to 1 V rms, model 3B43 accepts signals ranging from 1 V to 50 V rms, and model 3B44 accepts inputs ranging from 50 V to 550 V rms. When used with external shunts, each unit can readily interface to ac currents .

FREQUENCY INPUT MODELS 3B45, 3B46
Models 3B45 and 3B46 are isolated modules that accept frequency inputs. Model 3B45 accepts full scale frequencies from 25 Hz to 1100 Hz while model 3B46 accepts inputs from 520 Hz to 25 kHz. Model 3B45 has a 15 ms debounce option. Both operate with either a 0 V or 1.6 V threshold and have adjustable hysteresis.

FEATURES
High Level Voltage Input (0 V to +10 V, ±10 V)
Process Current Output (4–20 mA/0–20 mA)
High Accuracy: ±0.1%
Reliable Transformer Isolation: ±1500 V CMV, CMR = 90 dB
Meets ANSI/IEEE-C37.90.1-1989: Transient Protection
Output Protection: 130 V or 220 V rms Continuous
Reliable Pin and Socket Connections
Low Cost Per Channel

GENERAL DESCRIPTION

Each output module accepts a high level analog signal from the system connector and provides a current output on the output screw terminals. When a +24 V loop supply is used, loads up to 850 Ω can be driven. If desired, +15 V can be used to power the output modules with a smaller load (up to 400 Ω). Each output module features high accuracy of ±0.1%. If isolation is required, the 3B39 provides ±1500 V peak common-mode voltage isolation protection.

The transfer function provided by each output module is:
Input: 0 V to +10 V or ±10 V
Output: 4–20 mA or 0–20 mA

Figure 3 shows a functional diagram for the model 3B39 isolated voltage-to-current converter. The input signal drives a voltage-to-current converter through the isolation barrier. Each output module has zero and span potentiometers for fine calibration of the current output.

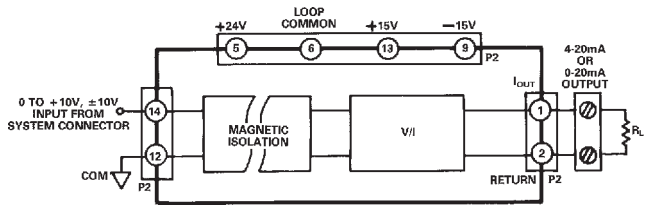
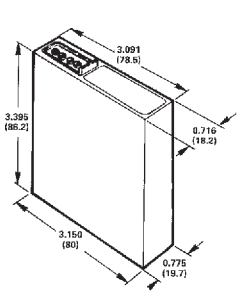
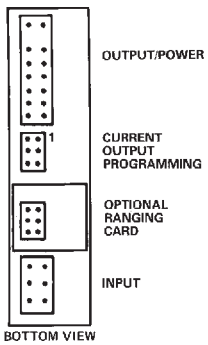


Figure 3. Model 3B39 Isolated Voltage-to-Current Converter Functional Block Diagram

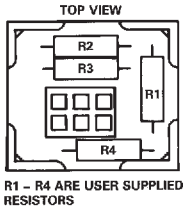
Each output module has two user programmable jumper options. One option allows the user to program the current output to be proportional to either a 0 V to +10 V input or a –10 V to +10 V input. The second option allows the user to set the current output span to 4–20 mA or 0–20 mA. All output modules are shipped from the factory so that the current output is proportional to the 0 V to +10 V input and all current outputs are 4–20 mA.

INPUT AND OUTPUT MODULE DIMENSIONS
MODULE CONNECTORS
PIN DESIGNATIONS





OPTIONAL RANGING CARD



R1 – R4 ARE USER SUPPLIED RESISTORS

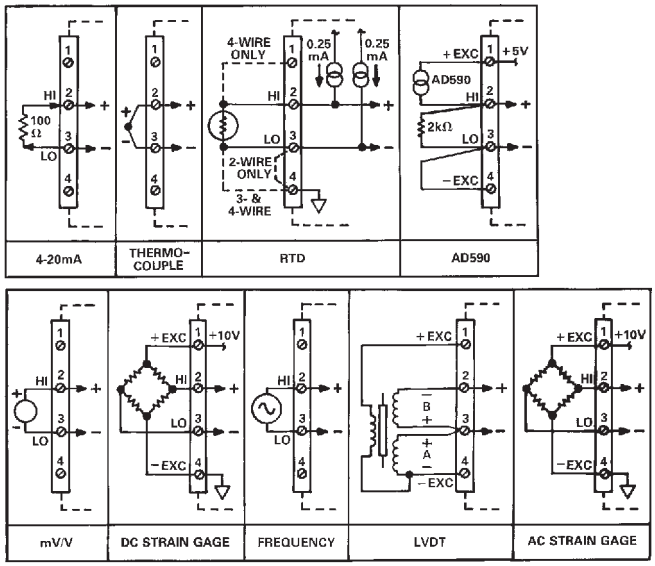
GENERAL OUTPUT MODULE SPECIFICATIONS

(typical @ +25°C and ±15 V, +24 V dc power)

Model	3B39, Isolated	3B19, Nonisolated
Inputs	0 V to +10 V, ±10 V	*
Outputs	4–20 mA or 0–20 mA @ R_L = 0 Ω to 850 Ω	*
Accuracy[1]	±0.1% Span	*
Nonlinearity	±0.01%	*
Stability vs. Ambient Temperature		
Zero	±0.0025% Span/°C	*
Span	±0.002% Reading/°C	*
Common-Mode Voltage, Output to Input and Power Supply	±1500 V pk max	N/A
Common-Mode Rejection	90 dB	N/A
Normal-Mode Output Protection	220 V rms, Continuous	130 V rms, Continuous
Zero and Span Adjustment Range	±5% of Span	*
Output Transient Protection	Meets ANSI/IEEE-C37.90.1-1989	N/A
Input Resistance	10 kΩ	*
Power Supply[2]	±15 V dc, +24 V dc	*
Maximum Input Voltage Without Damage	±20 V	*
Size	3.150″ × 0.775″ × 3.395″	*
Environmental		
Temperature Range, Rated Performance	–25°C to +85°C	*
Storage Temperature Range	–55°C to +85°C	*
Relative Humidity Conforms to MIL Spec 202	0% to 95% @ 60°C, Noncondensing	*
RFI Susceptibility	±0.5% Span Error, 5 W @ 400 MHz @ 3 ft.	*

NOTES
[1]Accuracy spec includes combined effects of repeatability and linearity.
[2]+24 V dc supply is only needed for driving loads of up to 850 Ω.
+15 V dc can be used for driving a 400 Ω maximum load.

Specifications same as 3B39.
Specifications subject to change without notice.



INPUT CONNECTIONS:
ALL INPUT CONNECTIONS USE #6–32 SCREW TERMINALS, COMPATIBLE WITH 14 AWG WIRE.

Figure 4. 3B Series Subsystem Input Connections

BACKPLANE FUNCTIONAL DESCRIPTION

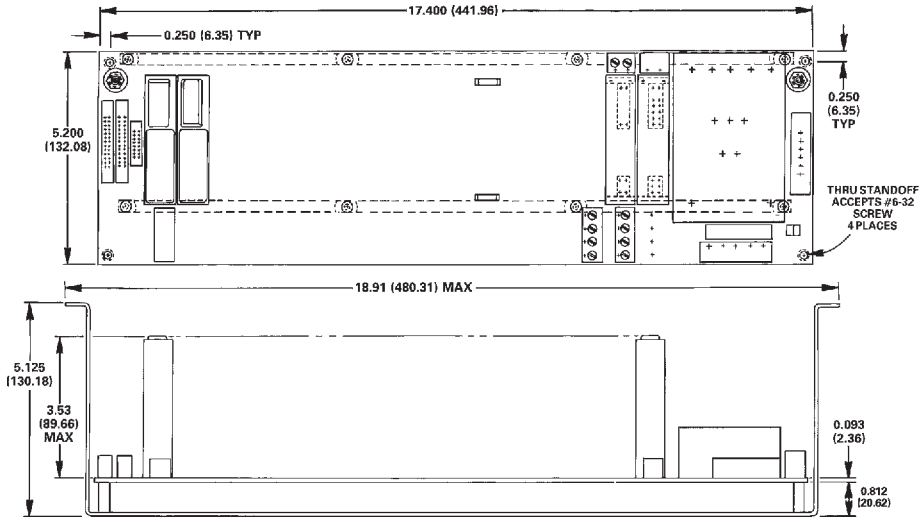
The 3B Series Signal Conditioning Subsystem consists of a family of backplanes, input modules, output modules and power supplies. The three backplane models, 3B01, 3B02 and 3B03 are designed for 16, 8 and 4 channels, respectively, to offer users the flexibility to match the size of a system to specific applications. The 16-channel backplane can be mounted in a 19″ × 5.25″ panel space. Several mounting options are offered, including rack, surface and NEMA enclosure mounting.

The 3B01 backplane can accommodate up to 16 signal conditioning modules. These modules can be fixed and matched in the backplane to provide the desired number of channels for a specific function. Each channel has four screw terminals for input connections. These connections satisfy all transducer inputs and provide transducer excitation when necessary. A cold junction sensor is supplied on each channel to accommodate thermocouple modules. Each channel has two screw terminals for the output connections for the 4–20 mA output. Two 26-pin system connectors provide high level voltage I/O for all channels.

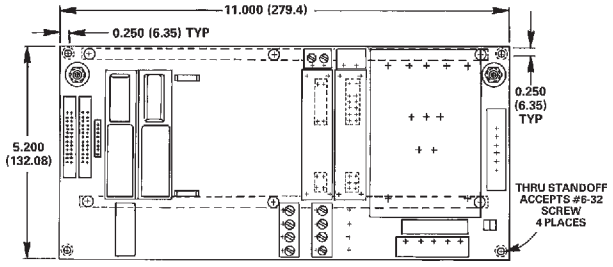
The 3B Series Subsystem offers high density packaging to conserve mounting space and can be easily tailored to fit the user's needs. All modules feature a universal pinout which assures interchangeability. The plug-in design allows easy reconfiguration.

OUTLINE DIMENSIONS

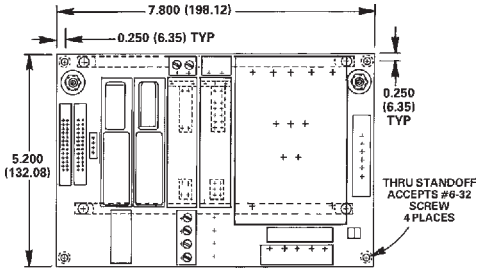
Dimensions shown in inches and (mm).



3B01 16-Channel Backplane



3B02 8-Channel Backplane



3B03 4-Channel Backplane

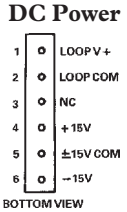
BACKPLANE SPECIFICATIONS

Model	3B01	3B02	3B03
Channels	16	8	4
Power Supply Options[1]			
External Power	±15 V	*	*
Requirements	+24 V	*	*
AC Power Supply[2]	100, 115, 220, 240 V ac	*	*
DC Power Supply[3]	+24 V	*	*
Cold Junction Sensor	Provided on Each Channel	*	*
Power Indicator	LEDs Indicate ±15 V and +24 V Power Applied	*	*
Physical			
Size (with Modules)	17.400″ × 5.200″ × 4.373″	11.00″ × 5.200″ × 4.373″	7.800″ × 5.200″ × 4.373″
Fuse	220 V Fuse at 500 mA (5 mm x 20 mm)	*	*

NOTES
[1]Actual Power Supply requirements are a function of the quantity and types of module used (see Table II).
[2]AC Power Supplies include AC1300 and AC1301. Each is offered in one domestic and three foreign versions. Refer to Power Supply Specifications.
[3]AC1302 is an optional dc Power Supply.
*Specifications same as 3B01.
Specifications subject to change without notice.

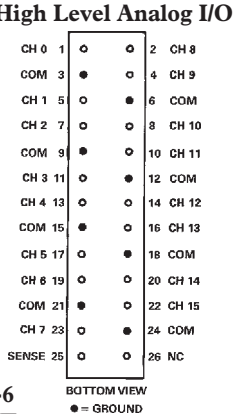
PIN DESIGNATIONS
BACKPLANE (3B01, 3B02, 3B03)

Power Connector
DC Power



MATING CONNECTOR:
AMP P/N 202237-1 (6 pcs.)
and
AMP P/N 207377-1
OR EQUIVALENT

System Connector
High Level Analog I/O



MATING CONNECTOR:
AMP P/N 499958-6
OR EQUIVALENT

POWER SUPPLY

The 3B Series Subsystem can operate from a common ac power supply or dc/dc (+24 V input) power supply mounted on the backplane or external ±15 V and +24 V supplies can be used. The power supply is bused to all signal conditioners on the backplane. Supply current is a function of the modules that are actually used (see Table II). The power supply outputs listed in the Specifications cover most cases. Each power supply operates over a –25°C to +71°C temperature range.

If the user wishes to use a +15 V supply for current output, the +15 V output of the AC1300 or AC1301 can be strapped to the loop power on connector P3. With this arrangement, the load resistance on current outputs is limited to 400 Ω max.

The AC1307 is an *open-frame,* triple output power supply that was designed to address the power requirements of the majority of 3B applications. When the ±15 V supplies of the AC1307 are fully loaded, the +24 V output of 350 mA will drive only thirteen 4–20 mA current loop outputs. When the ±15 V supplies are loaded at 80% or less, the +24 V may be used to power a full rack of sixteen 4–20 mA outputs.

If +24 V is supplied from an external source, a dc/dc converter (ADI model AC1302) can be used to supply ±15 V to the backplane. The current loop power is provided from the +24 V source which must be capable of handling the desired number of current loop outputs.

If both +24 V and ±15 V are supplied from an external source, the power supply requirements must be satisfied for the desired number of modules.

Table II. Power Requirements

Model	+15 V dc Current	–15 V dc Current	+24 V dc Current
3B10	10 mA	10 mA	27 mA
3B11	10 mA	10 mA	27 mA
3B12	10 mA	10 mA	27 mA
3B13	12 mA	12 mA	27 mA
3B14	20 mA	20 mA	27 mA
3B15	20 mA	20 mA	27 mA
3B16	45 mA	10 mA	27 mA
3B17	65 mA*	65 mA*	27 mA
3B18	50 mA	15 mA	27 mA
3B19	4 mA	4 mA	27 mA
3B20	65 mA	65 mA	27 mA
3B30	10 mA	10 mA	27 mA
3B31	10 mA	10 mA	27 mA
3B32	10 mA	10 mA	27 mA
3B34	10 mA	10 mA	27 mA
3B37	12 mA	12 mA	27 mA
3B39	5 mA	5 mA	35 mA
3B40	10 mA	10 mA	27 mA
3B41	10 mA	10 mA	27 mA
3B42	10 mA	10 mA	27 mA
3B43	10 mA	10 mA	27 mA
3B44	10 mA	10 mA	27 mA
3B45	16 mA	16 mA	27 mA
3B46	19 mA	19 mA	27 mA
3B47	16 mA	14 mA	N/A

*Typical number is 40 mA per module plus ±5 mA for LVDT drive Current. Supply current requirements for LVDT current is 75% of the LVDT rms current.

Module currents for rated supply inputs, full-scale outputs and no load on voltage outputs.

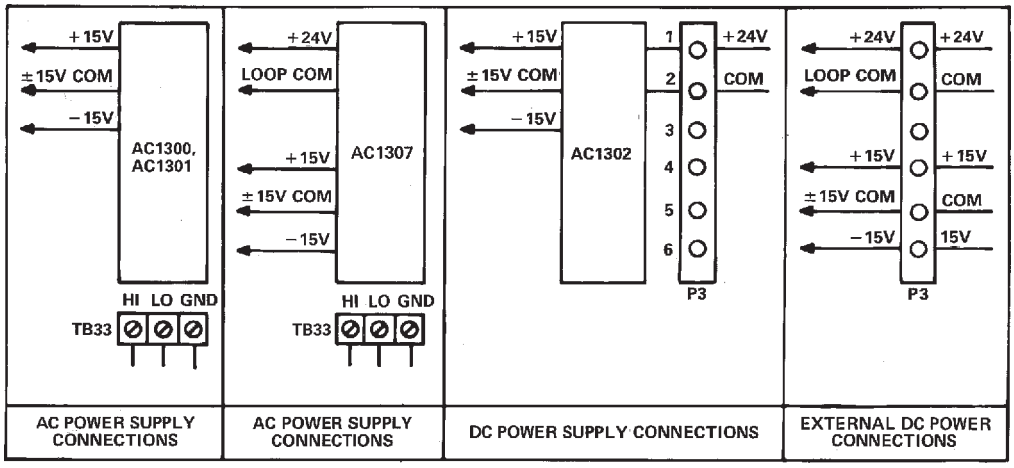


Figure 5. Power Supply Connections

POWER SUPPLY SPECIFICATIONS

Model	AC1300	AC1301	AC1302	AC1307
Input Voltage	105 V–125 V ac, 50 Hz to 400 Hz 205 V–240 V ac, 50 Hz to 400 Hz (AC1300E) (AC1307E) 90 V–110 V ac, 50 Hz to 400 Hz (AC1300F) 220 V–260 V ac, 50 Hz to 400 Hz (AC1300H)	105 V–125 V ac, 50 Hz to 400 Hz 205 V–240 V ac, 50 Hz to 400 Hz (AC1301E) 90 V–110 V ac, 50 Hz to 400 Hz (AC1301F) 220 V–260 V ac, 50 Hz to 400 Hz (AC1301H)	22.3 V–26.4 V	105 V –25 V ac, 50 Hz to 400 Hz 205 V–240 V ac, 50 Hz to 400 Hz
Output Voltage	±15 V	±15 V	±15 V	+15 V, –15 V, +24 V*
Output Current	±200 mA	±350 mA	±190 mA	+800 mA, –225 mA, +350 mA
Operating Temperature	–25°C to +71°C	–25°C to +71°C	–25°C to +71°C	–25°C to +71°C
Storage Temperature	–25°C to +85°C	–25°C to +85°C	–40°C to +100°C	–25°C to +85°C
Dimensions (Inches)	3.5 × 2.5 × 1.25	3.5 × 2.5 × 1.62	2.0 × 2.0 × 0.38	4.0 × 2.8 × 3.4

*The +24 V output is unregulated.

SELECTION GUIDELINES

When ordering 3B Series products, the total system configuration must be considered. The following information is intended to serve as a guideline. The 3B Series Ordering Guide provides a more complete description of all the elements. Should you have additional questions, contact our sales office in your area.

A typical 3B Series system configuration might consist of a 3B01 backplane, sixteen 3B series modules, a power supply (AC1301), a power cord (AC1340-D), an interface cable (AC1315) and a rack mount chassis (AC1330). A universal interconnection board may be used to connect the high level voltage outputs to any analog I/O subsystem. If panel or NEMA mounting is desired, the AC1331 might be used. Refer to the 3B Series Ordering Guide for additional information on accessories and spare parts.

MODULE CONFIGURATION

Each module is available in the standard ranges defined in the Ordering Guide. If a special range is needed, it can be provided with the externally programmable version of the desired module, the plug-on ranging card, AC1310, and user supplied resistors that determine the zero and span of the range. The resistor values vary from module to module. Detailed information on the required resistor values is provided on the appropriate data sheet within the User's Manual. If desired, special ranges can be factory configured. Consult the factory for further information.

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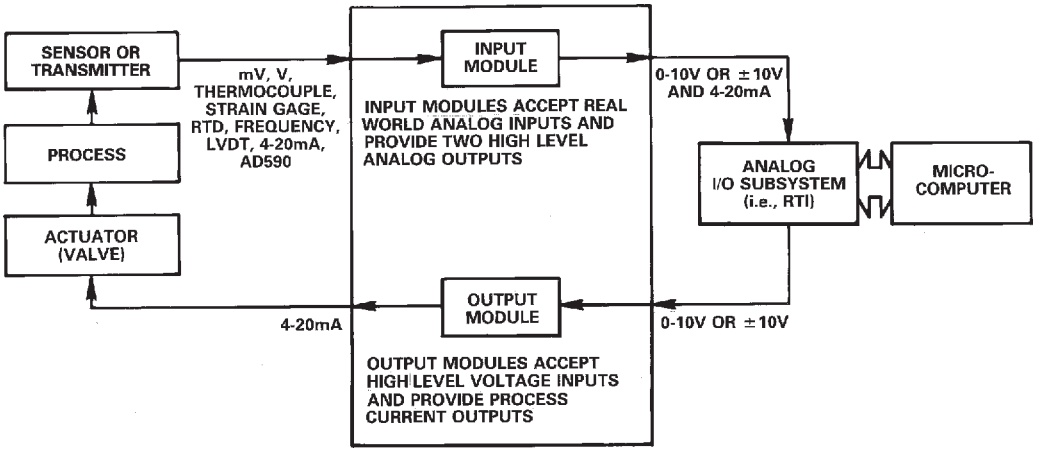
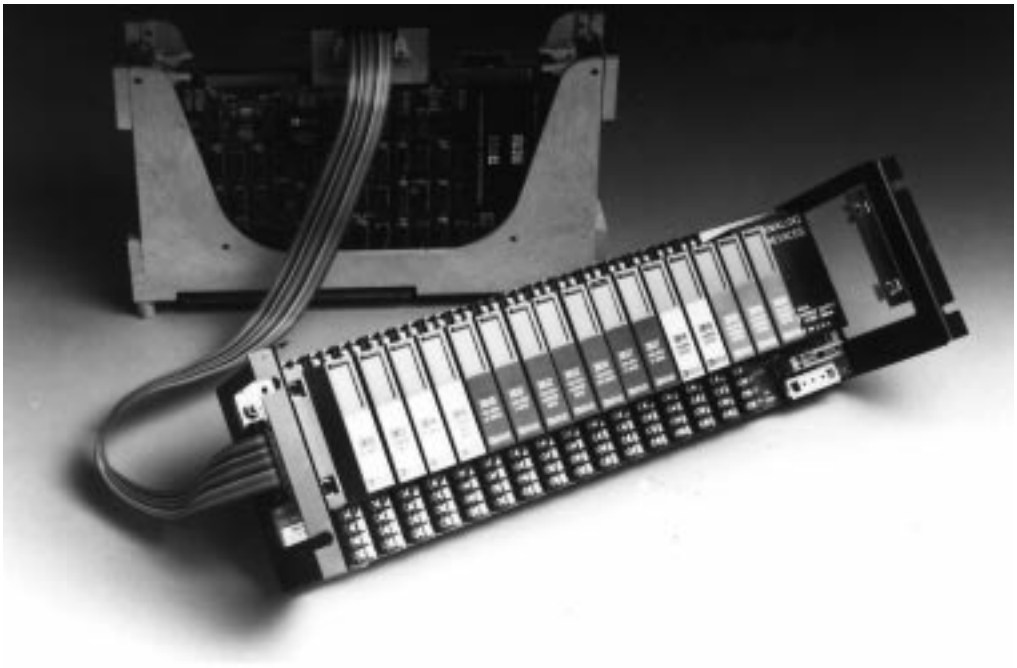


Figure 6. Functional Block Diagram of a Typical Measurement and Control Application Using the 3B Series Subsystem Which Is Shown Below with an Analog Devices' RTI-711

APPLICATION EXAMPLE

An example of how the 3B Series Subsystem might be used with an analog I/O subsystem in a measurement and control application is shown in Figure 6. The sensor, which could be a thermocouple, is directly connected to the input module. The high level voltage output of the input module is compatible with any high level multiplexer or analog-to-digital converter, which converts the data to the digital form the microprocessor requires. The digital output of the microprocessor is connected to a digital-to-analog converter that provides a high level output voltage. The output module converts this high level voltage to a process current which can be used to drive an actuator or any other control element.



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